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# Innovating tree plantation design: Spiralographing agroforestry



Fig 1: Spiral plantation with 240 trees (*Quercus suber* L.) with 12 meters between lines allowing the tractor to move inwards and outwards inside the spiral

## Introduction

- Most of (agro)forestry artificial plantations either have an orthogonal design, or curvilinear under contour lines
- These designs are known to maximize machinery workflow or erosion control.
- As in many occasions in land use management, what optimizes machinery operation is not what optimizes prevention of soil loss and vice versa.

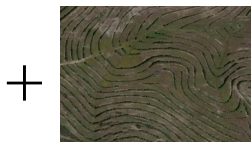
Is there a middle term?

Proposing the Archimedes Spiral:

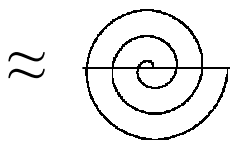
- have equidistant lines to facilitate machinery operations
- reduce soil loss in comparison to orthogonal designs
- alternative when considering aesthetics



Orthogonal  
Facilitate operations



Curvilinear  
Maximize erosion control

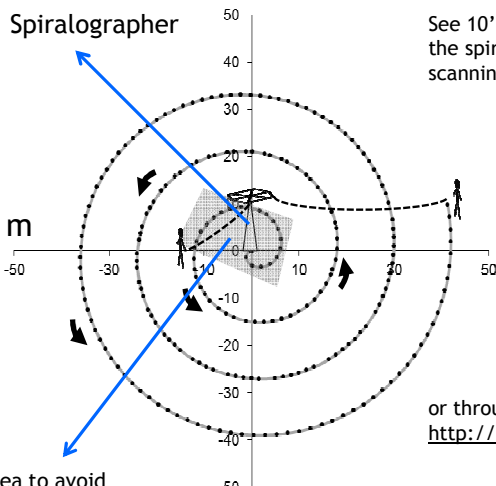


- The objective of this work is to contribute to knowledge of planting trees in an Archimedes spiral design, while exploring an option to achieve a spiral plantation in practical terms without high technology

## Material and Methods

- Build a spiralographer (Fig 2). An hexagon with flexible radius (r) enables to set the tree line width (lw) as  $lw = 6 * r$

Spiralographer



\* Quick Response (QR) codes were tested with QRdroid app.

## Example of a Field Spiralographer

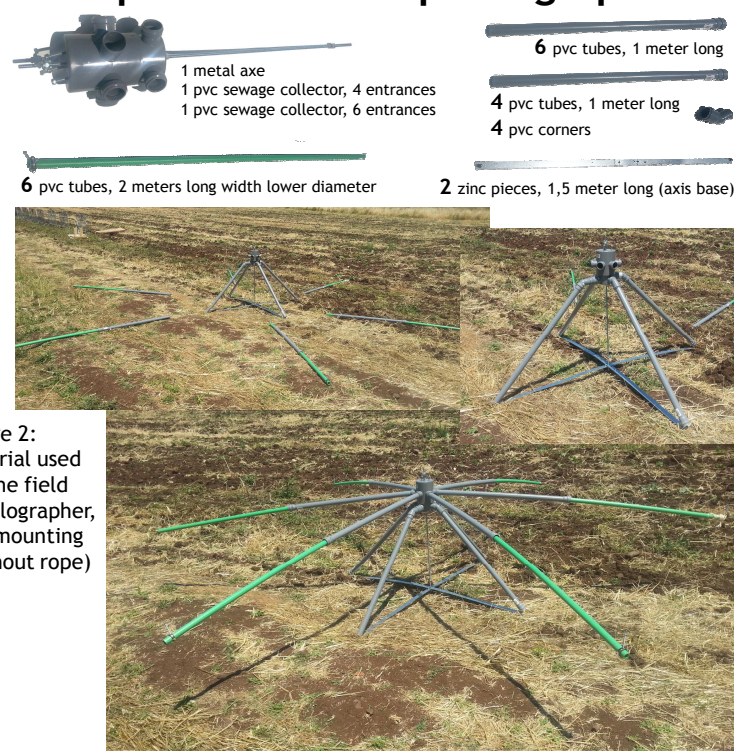


Figure 2:  
Material used  
for the field  
Spiralographer,  
and mounting  
(without rope)

## Results and Discussion

- The practical result is presented in Figure 1.
- Non High-Tech tools posed interesting challenges. Given the result obtained, we can consider that the tool and method used **contributes for the knowledge on planting trees in a spiral design.**
- Disadvantages and Advantages of this design are **still being studied**, e.g. radiation distribution, soil loss, labor time.
- Note from the farmer: “kids should come and see what a hexagon could be used for. Sometimes at school we learn abstract mathematics, but it’s much more fun when actually seeing applied basic mathematics growing in front of our eyes”
- We could describe the tractor driver behavior BEFORE the final result as being “worried” and somehow “lost”, just following orders for drilling. AFTER he said (to the farmer) “this is not so nonsense after all... It might actually work!” when thinking about the tractor maneuvering.